

## ELECTRIC POWER AND TRACTION.

*Electric Power and Traction.* By F. H. Davies. Pp. vi+293. (London: A. Constable and Co., Ltd., 1907.) Price 6s. net.

ELECTRIC power and traction is such an immense subject that it is rather a bold undertaking to deal with it in a small volume of 293 pages, even if the reader is supposed to know the elementary laws of electrical engineering. The book, however, does not pretend to be a regular text-book, but it is evidently intended for those whose knowledge of electrical engineering is limited, and to these as well as students it can be recommended.

Four chapters deal with the generation and distribution of power. The various systems of direct and alternating current are briefly discussed, and descriptions of typical installations are given. As the author briefly touches upon the subject of direct-current high-tension transmission, it is rather surprising that no mention is made of the Thury system, which has come into prominence during the last few years.

Two chapters are devoted to D.C. and A.C. motors, and their principles are expounded. In directing attention to the starting-up of induction motors, the author omits to mention the important method of changing from "star" to "delta" on the stator, which is used for most squirrel-cage motors up to 20 horse-power.

The chapters on the application of electric power are the best in the book, and the advantages of electric driving are clearly brought out. On p. 124 there appears a statement which shows that, in the author's opinion, the time is not far distant when the voltage for lighting ships will be raised to 200 or 240, but this prediction will not command universal assent. The modern tendency even on shore is to return to 110 volts, especially since the introduction of metallic filament lamps, and it seems more probable that 100 or 110 volts will remain the standard voltage for marine work.

The last ten chapters of the book are devoted to electric traction, and although one may find in them a few statements which are open to criticism, they contain a good deal of practical information. The conduit and surface-contact systems are dealt with, and the advantages of electric traction are briefly set out. Full details are given of the direct-current system in use on the Metropolitan, District and London tube railways. The benefits of "multiple-unit control systems" are briefly touched upon. In view of the prominence given to the Westinghouse control system, it is surprising that no mention is made of the British Thomson-Houston system, the more so as the latter is in use on nearly all the London tubes and underground railways.

In his remarks on substations the author, in dealing with motor-generators, has omitted to mention Bruce Peebles' motor-converters, which in recent years have come largely into use, notably on the Great Western Railway, where it is the standard equipment for all substations.

On p. 240 the novel statement appears that the middle rail on the Metropolitan and District railways

is not protected, "because it is practically at earth potential." Perhaps if the author would try it, by touching it, he might change his opinion.

The exposition of the *pros and cons.* of three-phase, single-phase, and D.C. systems is not absolutely convincing, because, to judge from the disproportionately numerous descriptions of single-phase locomotives, it would almost seem that the author has an unduly high opinion of this system. It might have been of interest if particulars had been given of the New York Central locomotives, as they represent the most recent practice in D.C. traction, and surpass anything that has been done, so far, with the single-phase system. The book is well printed, and illustrated by excellent photographs. It contains a good deal of sound practical information, and can be recommended to the class of readers for whom it is intended.

L.C.

## SCHOOL CHEMISTRY AND PRACTICAL ORGANIC CHEMISTRY.

*The Complete School Chemistry.* By F. M. Oldham. Pp. viii+416. (London: Methuen and Co., 1907.) Price 4s. 6d.

*Practical Chemistry for Army and Matriculation Candidates.* By Geoffrey Martin. Pp. viii+144. (London: Crosby Lockwood and Son, 1907.) Price 2s. net.

*Systematic Practical Organic Chemistry.* By G. M. Norman. Pp. viii+98. (London: W. B. Clive, University Tutorial Press, Ltd., 1907.) Price 1s. 6d.

*A Course of Practical Organic Chemistry.* By T. Slater Price and D. F. Twiss. Pp. xiii+239. (London: Longmans, Green and Co., 1907.) Price 3s. 6d.

*A Scheme for the Detection of the More Common Classes of Carbon Compounds.* By F. E. Weston. New edition. Pp. viii+95. (London: Longmans, Green and Co., 1907.) Price 2s. 6d.

M.R. OLDHAM'S book provides a complete course of instruction for schools. He has had in view the London matriculation and the Army entrance examination, but has added important sections not included in either syllabus, which he says with a touch of irony "should be taught wherever a teacher is free from the trammels of an examination syllabus and need think only of giving sound instruction."

Judging from a general survey of the book, we are inclined to think that the syllabuses above mentioned were not altogether present in the author's mind when he wrote it, for sound instruction is certainly the keynote of his method.

Part i. especially is excellently arranged, clearly written, and admirably illustrated. If the school time admitted of it one could not devise a better course for the beginner in chemistry; but the standard eventually reached is far beyond that of any matriculation candidate, and one is doubtful if even three school years would suffice to cover the ground mapped out, unless, indeed, the experimental part were performed for, instead of by, the student, which would be a misfortune. The programme is an ambitious one; but we believe it is thoroughly sound, and if it could be

begun at school and carried to the end of part i. slowly and methodically, it would form an excellent groundwork for a subsequent college course.

There is little to criticise. Attention should be directed to one omission which is not uncommon in elementary text-books. It states on p. 40 that "you have found out that hydrogen is contained in acids." It is quite true that hydrogen is described as being obtained by the action of acids on metals, but there is no suggestion as to where the gas comes from, and, so far as any information to the contrary goes, it might just as well come from the metal. Some explanation or comment is called for, because a few pages further on the action of acids on carbonates is described, and in this case the process appears to be reversed, the gas coming from the solid and not from the acid.

We should like to see electrolysis entirely banished from elementary books. The decomposition of water by the current is a mysterious and unconvincing experiment. It is difficult to understand why the gases appear at the ends of two different platinum wires, and why the volumes which collect should represent the true composition of the liquid. The union of the two gases to form water by means of the electric spark only serves to heighten the mystery. A careful drilling in these two operations gives the schoolboy an agent which in his imagination will produce or decompose every compound gas that ever existed, and he uses this knowledge, as we all know, with a reckless facility. It is a satisfaction to find that Lavoisier did not, as we are generally told, institute experiments to prove the conservation of matter, but, as the author states, did several experiments which showed it. Lavoisier simply took the principle for granted, as most chemists had done before him, from Boyle onward. Dalton, by the way, was not exactly a schoolmaster in Manchester, though he served in that capacity at Kendal.

The attractive appearance, substantial get-up, and exquisitely drawn diagrams of Dr. Martin's book command at once a careful perusal. It differs essentially from the foregoing in confining itself to the practical, or, perhaps more strictly, to the manipulative side of chemistry. Each experiment stands alone, and has no necessary connection with the one that precedes or follows it, minute directions being given for its performance. It is also for Army and matriculation candidates, and will no doubt prove very useful to both candidate and teacher as a laboratory *vade mecum*.

Mr. G. M. Norman's "Systematic Practical Organic Chemistry" is one of the organised science series, and is intended to meet the requirements of stages i. and ii. of the Board of Education examination. It contains a description of a series of simple preparations and a variety of useful tests. It is satisfactory to find that the Board of Education now requires evidence that the candidate has carried out a number of preparations before presenting himself. It is to be hoped that before long the Board of Education will take the further step of requiring the evidence without the candidate. No kind of chemistry lends itself to a two or three hours' practical examination, organic

chemistry perhaps least of all, and the evidence of knowledge elicited by the sort of experiment set at these examinations has very little value. That, however, does not impair the usefulness of the book under review, which may be safely commended both for the purpose it is intended to fulfil and also as an introduction to practical organic chemistry.

Messrs. Price and Twiss's "Practical Organic Chemistry," like the preceding volume, owes its origin to the new syllabus of the Board of Education, and is intended to meet to some extent the requirements of stage iii. (theoretical organic), as well as to prepare for stages i. and ii. (practical organic) of the Board's examination. The treatment of the subject is full and comprehensive. It contains the usual series of simple preparations, an account of the qualitative and quantitative examination of organic compounds, molecular-weight estimations, and useful schemes of analysis. Without introducing any specially novel features, it presents a fairly complete programme of practical study which if carefully carried out should form a sound basis for subsequent research in organic chemistry. The descriptions are clear and concise, and the illustrations, though not numerous, are probably sufficient for the purpose. It may be recommended as a thoroughly safe book for the laboratory.

Mr. Weston's book on the detection of organic compounds deals, as it states, with qualitative methods only. That such a book should have reached a second edition and should serve the needs of the final B.Sc. of the London University and of the honours stage of the Board of Education is a hopeful sign of the times, if we must have this kind of test. Such defects as the book possesses, and they are not numerous, are to be attributed to the fact that it is written to meet the requirements of a practical examination where time is an important factor.

The author confines his attention to the study of pure organic substances only, giving directions which, if carefully followed, should lead to their detection, and at the same time to the acquisition of much useful information and manipulative skill on the part of the student.

This is all thoroughly sound and satisfactory so long as it is recognised that it is an introduction to analysis, and that the real laboratory problems involve such things as the separation of mixtures and the purification of impure products. It appears from a general perusal of the book that some of the directions need amplifying. This refers more particularly to the means of ascertaining the presence of oxygen, upon which the grouping of the compounds is based, to the identification of aromatic hydrocarbons (p. 12), to Fenton's oxidation method for detecting keto-hexoses (p. 47), and to Fischer's benzaldehyde green reaction for aldehydes (p. 40). We would also suggest the following additions or modifications in a future edition:—the use of bromo- and nitro-phenyl-hydrazine, methyl sulphate and semicarbazide as useful reagents and of Tollens' reagent (the name, by the way, is spelt with an "s") for pentoses, also the consistent use of the modern system of nomenclature and a good index.

J. B. C.